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City-networks, global climate governance, and the road to 1.5 °C

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This article reviews existing scholarship on the ability of transnational city-networks to contribute to achieving a global 1.5 °C target. Its principal observation is that city-networks have become increasingly involved in pooling resources, setting agendas, sharing policies, and reporting emissions reductions, but more needs to be known about how precisely transnational city-networks are achieving verifiable emissions reductions at the urban scale. The article identifies a focus in contemporary research on direct and indirect pathways through which city-networks can potentially effect transformative change, and highlights four key issues in need of further research: burden-sharing within and across city-networks; the suite of possible policy options they are embracing and endorsing; the role and voice of marginal cities and vulnerable urban populations, and; the governance challenges related to moving from experimentation to collective global effect.

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Introduction

A variety of city-networks have, in recent years, begun to coalesce around ambitious claims regarding their capacity to contribute to the pursuit of a 1.5 °C global target. These include, inter alia, the C40 Cities Climate Leadership Group, Carbon Neutral Cities Alliance, ICLEI, and Global Compact of Mayors, each of which has committed to a coordinated effort to reduce GHG emissions and achieve transformative change through interventions in urban settings.[3] We provide, in this review article, a brief state of the art of recent efforts to assess the capacity of city-networks to translate these ambitious claims into meaningful results. We first set out to establish what a 1.5 °C target means for cities and how city-networks have addressed themselves to the task. We then assess the cumulative effects that city-networks have achieved to date, and assess efforts to project their potential future contributions. Subsequently, we identify in the literature two pathways along which city-networks link discrete urban interventions to meaningful global effects, and conclude by highlighting a set of four key issues towards which future research should be oriented: the politics of burden-sharing within and across city-networks; the suite of possible policy options city-networks are embracing and endorsing; the role and voice of marginal cities and vulnerable urban populations, and; the governance challenges related to moving from experimentation to collective global effect.

What can city-networks contribute to a 1.5 °C target?

City-networks offer one possible mechanism through which a global 1.5 °C target can be achieved. Such networks bring together cities, on a voluntary basis, and aim to foster increased interaction, exposure, and communication as a means of increasing the mobility of effective policy interventions (such as, inter alia, Bus Rapid Transit, cycling infrastructure, building retrofit programmes, and LED lighting systems). First emerging in the early 1990s with the creation of ICLEI and the Climate Alliance, these networks have shifted from the margins of the global climate regime to a position of greater prominence and ambition. While there remains variation with respect to the focus of their efforts — ranging from political advocacy and lobbying at the UNFCCC scale to the relatively autonomous pursuit of collective global effects — there has been a good deal of consolidation around transnational city-networks as the primary vehicle through which cities participate in the global response to climate change.

[3] Similar city-networks operate at regional and national scales, but we limit our focus here to those networks whose activities and membership cross national boundaries and who have explicitly committed to pursuing globally meaningful effects related to the mitigation of greenhouse gases.

Our focus, in this article, is primarily on the latter — the efforts of transnational city-networks in coordinating the mitigation actions and agendas of cities — and how these might contribute to achieving a 1.5 °C target. The case for taking this claim seriously rests, in the first instance, on a demonstrable increase in the number and extent of such efforts. A report issued jointly by the C40 and Arup [1] documents '228 global cities, representing 436 million people, [that have] set greenhouse gas reduction goals and targets amounting to a cumulative reduction of 13 GtCO2e by 2050.' The carbon*n* Climate Registry [2], a separate reporting platform, reports 608 cities, representing 553 million people, as having registered commitments for reducing the equivalent of 1.0 GtCO2e. NAZCA — the Non-State Actor Zone for Climate Action established by the UNFCCC Secretariat in 2014 — reported 11 615 climate change commitments as of 2016. In each of these, the vast majority of reporting cities do so as a function of their city-network commitments.

Particularly important in this regard is the role that city-networks have played in establishing baselines, recording actions, calculating carbon budgets, and mapping out future reductions scenarios and trajectories [1,3]. Methodologies and platforms for estimating and reporting emissions reductions are now seen as critical elements of coordinating an effective response to the 1.5 °C challenge [3–6]. However, producing reliable estimates that can be used for future emissions trajectories and scenarios entails methodological challenges [4,7•]. First, many estimates are based on Scope 1 and 2 production emissions that occur within a city's municipal boundaries, excluding Scope 3 emissions associated with the consumption of food and materials that are produced outside of the municipality [8]. Second, many cities are unable to provide reliable or comparable data, reflecting disparities in income, capacity and non-comparable methodologies [7•]. Third, aggregate indicators provide at best a partial illustration of the extent to which cities are contributing to climate change, underplaying substantially the variations that exist in terms of density, connectivity and other aspects of resource and energy consumption [9].

In spite of these challenges, recent assessments have isolated some of the key areas in which substantial emissions reductions will need to occur [1,3,4,10•]. According to the UNEP Emissions Gap Report, total GHG emissions showed a 'steady increase, reaching approximately 52.7 GtCO2e in 2014' [11]. Ericksen and Tempest estimate that in the transit and building sectors alone, cities will add another 50 GtCO2e per year to an already existing 800 GtCO2e of emissions [4]. Elsewhere, the C40 estimates that staying within 1.5 °C will entail a 2.1 tCO2e per capita reduction, requiring 14 000 additional 'actions' on top of the 10 000 actions already taken between 2009 and 2015 [3]. Underlying these projections are assumptions regarding the extent to which cities are able to envision alternative policy scenarios that decouple from existing 'business as usual' scenarios, scale up local interventions that can disrupting fossil fuel dependency, and implement systems that can manage and mitigate the effects of urban consumption, production and waste [12–14]. Erikson and Tempest, to this end, identify an aggressive 'urban action' scenario, in which energy-efficient technologies and urban design can avoid committing about 45 GtCO2e of cumulative future emissions [4]. Singh and Kennedy highlight the role of urban density [5], while Deadline 2020 focuses urban planning, transit, energy, buildings and waste [3].

Two pathways from networked urban climate governance to systemic transformation

While city-networks have advanced ambitious claims, there is little research that looks explicitly at their ability to contribute to achieving a 1.5 °C global target. In this respect, academia appears to be lagging behind the networks themselves, with the latter modeling possible trajectories and sets of actions that cities can take in pursuit of this goal [1,15]. Nonetheless, our reading of the scholarship suggests two distinct pathways by which city-networks may be contributing to lowering the global urban carbon footprint.

Direct pathways towards transformation

One pathway concerns the standardization of emissions measurements that may be used in comparing the progress of cities against the 1.5 °C target, thereby linking particular network initiatives to specific, identifiable emissions reductions. An underlying idea here is that of a direct contribution to the global effort — a closing of the 'emissions gap' through the production of collective effects [4,16]. This has spurred efforts by city-networks to develop and drive convergence around specific methods and standards of urban GHG emissions measurement, a trend best exemplified by the creation of the Global Greenhouse Gas Protocol for Cities (GPC) — an emissions measurement standard developed in partnership by the C40, ICLEI, and World Resources Institute (WRI) with support from the World Bank and UN-Habitat [17]. While consolidation is evident around global standards such as the GPC, there remains a disconnect between the emissions measured by cities, which are almost always calculated on the basis of territorial or production-based accounting systems, and the emissions associated with urban populations and economies, which require a consumption-based accounting system [7•,18]. It has been noted that the GPC relies heavily on the downscaling of national data related to energy consumption and transportation activity, the accuracy and relevance of which are uncertain [9]. And while the underlying proposition at work is that better measurement and more disclosure creates conditions that augment the ability of city-networks to contribute to the global effort

[19,20], Widerberg and Stripple identify a lack of 'information on the *ex post* impacts of initiatives, both by qualitative reporting through, for example, progress reports, or through quantitative reporting such as calculations of achieved emission reductions' [21,22]. One interesting possibility is offered by Chan and colleagues [23] but questions remain regarding the challenge of holding city-networks accountable for their commitments [24,25].

Indirect pathways towards transformation

In light of the challenges related to calculating the direct contribution of city-networks to global objectives, a separate body of work focuses on indirect pathways between urban interventions and transformative effects. This scholarship offers a means of gauging the potential for city-networks to disrupt the status quo through shifts in consumer demand, consumption patterns, values, and habits [26–28]. Here we want to highlight two intriguing manifestations.

The first concerns the tension inherent between subnational and national governments, and the extent to which city-networks provide cities a means of pushing, prodding, or otherwise provoking national governments into more assertive or aggressive climate policy actions. Embodying a variant of the 'California effect' [29] scholars suggest that city-networks can serve to encourage, enable, or embolden national governments to increase the ambition of national policies. Broekhoff *et al.* point to their capacity to be 'critical implementers' and 'strategic partners' of the national government, as opposed to autonomous actors pursuing emissions reductions on their own [16]. Macedo *et al.* advance a similar argument, and trace the political and policy effects of innovation and ambition from the urban to the national scale in Brazil [30]. At the same time, scholars have argued that domestic regulations deployed by national governments create conditions that enable, or inhibit, the ambition and impact of urban climate governance initiatives [31–33] and city-networks could potential delegitimize the global climate regime [34]. In light of the response of US Mayors to shifts in federal policy, and the augmented ambition and activity of city-networks, this is a line of inquiry worthy of further investigation.

A second manifestation of indirect effects explores the capacity of city-networks to create conditions in which transformative outcomes can emerge [4]. This line of research looks to identify and assess the ways in which networks, for example, create novel coalitions of actors in support of transformative actions, build the capacity of cities to engage in transformative actions, or normalize the pursuit of transformative change or open up space for socio-technical innovations to take root and generate support and momentum [35]. van der Ven and co-authors argue for augmenting technical evaluations of city-network contributions by taking seriously the non-quantifiable 'value' of initiatives that serve to render city efforts more durable and far-reaching [36••]. Elsewhere, Bulkeley and colleagues direct attention towards the experimental, contextualized, and heterogeneous modes of intervention in urban spaces that seek to disrupt the carbon-intensive status quo and open up space for thinking and practicing decarbonized lifestyles and modes of urban life [28,37,38]. Here we see a shift in emphasis towards understanding and assessing the particular ways in which transformative change is pursued through what Hodson *et al.* refer to as the 'reconfiguration of social and economic innovations in urban space' [12]. Yet questions remain with respect to how this sensitivity to the particularity of urban transformation can help to assess the aggregate contribution of city-networks to global objectives. Tipping points and non-linear processes of change are compelling, but typically lend themselves to a retrospective rather than prospective form of analysis.

Taking stock, looking ahead: four key issues related to city-networks and 1.5 °C

Alongside the multilateral process, city-networks have forged new channels and pathways that offer the potential for catalyzing and cajoling cities into pursuing the 1.5 °C target. However, their ability to drive urban emissions reductions is embedded within a number of political dynamics that have important bearing on whether and to what extent they will make a difference. Below we highlight four key areas that merit further empirical investigation and critical analysis: the politics of burden-sharing within and across city-networks; the suite of possible policy options city-networks are embracing and endorsing; the governance tools required to move from experimentation to collective effect; and the role and voice of marginal cities and vulnerable urban populations.

The politics of burden sharing in city-networks

City-network governance often entails ordering and sequencing the commitments of member cities in relation to mitigation targets. The C40, for instance, differentiates cities on the basis of emissions projections and GDP per capita, outlining a range of reduction trajectories that vary in relation to income and historical emissions [3]. However, sharing the burden of emissions reductions entails a number of challenges that are as yet poorly addressed (for example, the low-end threshold for Deadline 2020 is $15 000 per capita, which appears to exclude a large number of high-emitting cities including Dhaka, Delhi, Kolkata, Mumbai). Consider, for instance, the distribution of social cost. According to Deadline 2020, the total cost of achieving an additional 14 000 actions in C40 cities by 2020 is US$375 billion. Although city-networks are working hard to secure financial resources for member cities [39,40] access to funding is often highly contingent upon national governments and international donors [41] and questions remain about what constitutes a fair and

equitable allocation of a global-urban carbon budget. Establishing a quantifiable threshold at which actors should be expected to bear costs is by no means an exact science, and the politics of inter-urban resource transfers (via carbon offsetting, emissions trading schemes, or pooled funds) remain under-explored.

The policy-menu of city actions

Meeting the 1.5 °C target also entails breaking the mold of carbon-dependent development, but decarbonisation entails a number of difficult policy trade-offs that are as yet unresolved within the literature. One concerns the role of negative emissions. Deadline 2020 indicates that, under some scenarios, achieving the overall carbon budget of 22 GtCO2e by 2100 will require achieving negative emissions of some sort, implying the use of geo-engineering of some variety [3]. However, aside from a handful of isolated instances [e.g. 42], examples of cities implementing negative emissions programmes in the form of sequestration, carbon capture and storage and other more controversial forms of geo-engineering are relatively thin, and there is little indication that city-networks have engaged in any sense (at either a policy or normative level) with technologies or policies related to, for example, solar radiation management [43]. A second and related issue concerns the challenge of achieving the optimal balance between regulation (in the form of municipal codes, taxes and by-laws) and incentives for low-carbon development. Before Paris, the Kyoto Protocol conveyed a strong preference for market-based instruments, such as carbon offsets and emissions trading [44]. Although some cities (notably Tokyo) have implemented emissions trading policies of their own, questions remain about the extent to which cities have the political and regulatory power to implement market-based instruments, and whether national and regional efforts to put a price on carbon will pass higher costs onto cities and municipalities [45]. Lastly, the manner in which mitigation targets are linked to broader sustainability goals, such as those embodied in the SDGs (and especially SDG 11) requires further investigation.

Inclusion/exclusion and the legitimacy of city-networks

A third issue concerns the factors affecting local, urban engagement in transnational city-networks. The bulk of research on city engagement in transnational city networks has focused on the efforts of large, industrialized cities to reduce (and advance an international agenda for reducing) GHG emissions, but researchers are pursuing new lines of inquiry into the ways in which global climate policy agendas are being framed and adopted at the urban scale [46–48]. Particularly important in this regard is the recognition that local capacity to engage in long-range planning for climate mitigation is itself unevenly divided [46,49] with poor and marginal cities lacking access to basic urban services and thus unlikely to share the goals of prioritizing climate mitigation [18,48]. This is supplemented by the observation that local efforts to reduce emissions and vulnerability are themselves embedded in a context of structural inequality that potentially undermines the ability of poor and politically marginal populations to engage in climate policy processes and decisions [18,48]. Empirical insights about the uneven nature of city engagement in transnational city-networks raise important questions about the extent to which local governance mechanisms and institutions are able to incorporate local populations into urban climate policy processes and decisions [50]. This has implications for both their democratic legitimacy and their functional effects since, due to long time horizons, climate change commitments are often low on the policy agenda of local politicians, officials and stakeholders. At the same time, important co-benefits have been observed in the form of infrastructural improvements in urban mobility, alternative energy and ambient air quality [38,42,51].

The governance of networked urban climate governance

A final issue is reflected in ongoing efforts to unpack whether, how, to what extent, and with what effects city-networks effectively 'govern' their constituent members. On one hand, it has been shown that city-networks possess a demonstrable capacity to stimulate city engagement in climate governance, in ways that reflect a genuine orientation towards problem-solving rather than solely for purposes of branding or green-washing [52,53]. Various scholars find evidence of city-networks steering member cities in particular directions through the diffusion of norms, practices and ideas [54–57]. On the other hand, the capacity of city-networks to move beyond the limits of self-selection and effectively bridge the gap between nominal commitments and costly action remains a pressing concern [31,58–60].

With respect to the latter, scholars have identified several factors that contribute to addressing these concerns. Aylett, for instance, highlights the importance of local institutional factors that serve as intervening variables operating between city-networks and their constituent members, while Dolsak and Prakash point to the important role of local NGOs in driving city engagement [50,61]. Additional research on how these factors fit together, and interact with other contextual factors, remain needed. There is also skepticism with respect to the capacity of city-networks to enact the kind of policies necessary to achieve a 1.5 °C target. James and Verrest raise a series of questions about the substance of what is diffused within and across city-networks, a line of inquiry most readily associated with the phenomenon of the 'smart city' and the tendency for climate governance to converge around techno-utopian and market-oriented policies and practices [62]. Davidson and Gleeson argue as much, in pointing out an underlying conservatism of city-networks' like the C40. Here research that looks at how and to what extent structural imperatives that prioritize economic productivity over ecological

sustainability — what Bernstein labels the 'compromise of liberal environmentalism' — manifest in city-networks would help to better assess their transformative potential [63,64].

These concerns highlight the issue of power in city-networks. Gordon and Acuto, for instance, draw, respectively, on Bourdieu's notion of social fields and Latour's actor-network theory to bring to light the complex power dynamics taking place within the C40 [65,66]. Each signals the ways in which a diverse constellation of actors — private corporations, philanthropic organizations, development banks, cities, and environmental groups, for example — has come together in/around city-networks in an attempt to both forge a common enterprise and to give that enterprise a particular shape and substance. In one respect, corporations, foundations, and international aid agencies are seen to be filling a need that stems from a lack of local and network capacity. At the same time they entail relations of financial, technical and political dependence that may limit the ability of city networks to contribute to achieving the 1.5 °C target [6,51,67].

Closely related to the question of power in city-networks is the need to better understand how such networks govern themselves, and how they interact with what Keohane and Victor call the global climate regime complex [68]. Hsu *et al*. set out a framework with which to map and assess both the horizontal (inter-city) and vertical (city-state-international treaty) congruity of climate governance initiatives, an approach that holds promise as a means of exploring possible synergies and disjunctures between city-network and inter-state initiatives [69•]. Another body of scholarship congregates around the conceptual framework of orchestration, in which global objectives are pursued through the use of governance intermediaries rather than by the direct imposition of rules on target audiences [70,71]. While of a relatively recent vintage, this body of work raises a set of interesting questions regarding the processes through which orchestration actually operates [72••,73] the politics taking place between orchestrators and their intermediaries [6], and the use of particular mechanisms — accountability initiatives for instance — as governance tools through which orchestrators achieve their objectives [74]. In light of city-network consolidation [75] and calls for greater integration of subnational initiatives into the global climate regime [76], this scholarship offers a promising foundation on which to assess and make sense of the direction and potential that these initiatives may possess as a result.

Conclusion

A central aim of this article is to explore the role of transnational city-networks in achieving a global 1.5 °C target. From the preceding, we can infer that city-networks are operating at the interstices of urban and global governance, building bridges across national borders between city governments and a variety of other actors, and aiming to engender coordinated actions that produce meaningful collective effects. On one hand, the growing prominence of city-networks in global climate politics suggests a fundamental transition; from the old pattern of state-centric, multilateral governance that underlies the UNFCCC to a transnational arrangement that is rooted in the active involvement of sub-state and non-state actors [21,26,60]. On the other, the apparent transformation adds a layer of complexity and uncertainty to the study of global climate politics, suggesting the need for new theories and concepts that may be used to understand this process [6,36••,41,71].

Conflict of interest

No conflicts of interest exist for either author.

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